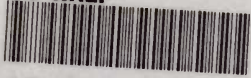


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*And in Economic Theory.*

*Professor Veitch.*

*Lucretius*

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LUCRETIUS  
AND  
THE ATOMIC THEORY.

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# LUCRETIVS

pp. 1-20

AND

# THE ATOMIC THEORY.

pp. 21-

BY

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Is Dedicated

*TO THE MEMBERS OF THE PHILOSOPHICAL SOCIETY  
OF THE UNIVERSITY OF EDINBURGH,*

*TO WHOM IT WAS READ,*

*AND AT WHOSE REQUEST IT IS PUBLISHED,*

*BY ONE WHO HAS MANY PLEASANT MEMORIES OF  
STUDENT DAYS PASSED IN THAT  
UNIVERSITY.*





LUCRETIVS  
AND  
THE ATOMIC THEORY.

THERE is a somewhat popular impression that speculation, or abstract thought, and imagination are incompatible. Perhaps they are rarely found together in remarkable exercise in the same individual; and this, while no proof of their incompatibility, is quite sufficient to satisfy a popular logic. I should be very sorry, indeed, to think that they are incompatible; for I do not know any greater help to the speculative power, or better corrective of vagueness in speculation, than imagination. The more you can individualise thought, the more clear it becomes, the less verbal, the more real; and all individualising, all embodiment of the abstract, is an imaginative effort, and often a very hard one. It is one certainly very unlike

that of the pseudo-artistic faculty, or rather tact, which is so common in these days, and which, animated by no true feeling either for nature or human character, looks at impressions as capable simply of being worked up into artistic shape, or made into images sensuously complete. This is the abandonment of thought, and the apotheosis of organism.

Of course the artistic faculty may be truly and nobly inspired by impressions from without, and it may love that outward world around us with a great and pure love. Its exercise is then genuine, beneficial, and elevating. Although between this side of imagination and the speculative effort there is no essential connection, the free love and the free picturing of the former are very helpful to the freshening of the latter, and in keeping us alive to the fact that there is a great impersonal side of things, over and above our individually constructed world of notions.

So far from there being any incompatibility between speculation, the search for the most general or universal element in our notions of things, and the play of imagination alongside of this, vivid as a real presence,—there is, in every normal thinker, a true harmony. They are, in fact, lines of a corresponding

rhythm; and we fail of the nearest and highest fruits of the speculative effort, if the glimpse we get into the ultimate meaning of things—of Origin, Space and Time, Power, Moral Law and Liberty—do not quicken the emotions through the imagination, and purify us by awe and reverence. The very indefiniteness of the intellectual vision, even after long speculation, is an element in its imaginative power; it is a suggestion of the limitless: and the emotions arising from it find their parallel in the grandest of those inspired by the outward world,—by glens whose depths are revealed to us by streaks of light that pierce their unfathomable shadows, or by long lines of gleaming waters that carry the eye upwards athwart the mountain height, and yet are finally folded in the mists that fill their urns.

This impression of an incompatibility between the intellectual and the imaginative is shown to be groundless by many names in the course of abstract speculation. Plato, Pascal, and others at once occur to us; but there is no more complete type in history of the fusion of the two qualities than the subject of this address—I mean Lucretius.

The poet is supposed to have been born B.C. 99,



and to have died B.C. 55, at the age of 44. The *De Rerum Natura* of Lucretius was probably first published the year after his death, in 54 B.C. If we except the early and now fragmentary metrical treatises on Nature of Xenophanes, Parmenides, and Empedocles whom Lucretius took for his model, it is the one poem of antiquity that has for its distinctive subject the phænomena of nature; and it is the one classical poem which shows a greater direct interest in outward nature than in human feeling or action. Though dealing with nature, it is in no way didactic, in the sense of laying down rules for the earth's cultivation,—for the practical subduing of nature,—after the manner of the *Works and Days* of Hesiod, and the *Georgics* of Virgil. Its primary interest is a speculative one. By *Nature* Lucretius means, as did the Greeks by their φύσις, the facts alike of inanimate, sentient and intelligent nature—as matter of scientific and reflective inquiry. Nature is indeed that which exists for us,—being as the matter of our experience; and it was looked at by those early thinkers with a fresh eye. There was little pre-supposition. The question as to whether nature involves a unity simply, or a dualism, was a point not

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assumed or foreclosed, but left to be decided as the result of investigation.

The main interest of the *De Rerum Natura*, thus, does not depend on simple observation and the description of phænomena, or on an aesthetical contemplation of them. We have these elements certainly, but they are entirely subordinate in the mind of the poet to the speculative interest in the origin, constitution, and permanence of the system of things which is given in experience. His imaginative feeling about Nature is of a very marked and intense kind; and it is inseparably connected with his ultimate metaphysical doctrine of the origin of the orderly world. Both the theory and the kind of feeling were new to Roman poetry, and they were never reproduced in its history.

Yet, in spirit and manner of treatment, there is a strong native element and Roman flavour about Lucretius. The Alexandrine school of philosophy and poetry was the fashionable one of his time,—idealistic in thought, sentimental in feeling, and delighting in the polish of style and verse. But Lucretius apparently would have none of it. He was repelled by idealising conceptions and mere em-

bellishment. In his direct description of nature, he is thoroughly realistic and genuine; his speculative theory altogether throws out mind, as a constitutive element; and he preferred to frame his verse after the rough model of Ennius, trusting for the impressiveness of his work to its body of powerful thought, and to the native vigour and sweep of his imagination. We know that metre frequently modifies thought and feeling by circumscription,—that as the metre is fixed, the compass of the thought often falls to be shortened, and its original conscious form changed, by having to pass into the definiteness of the metric mould. The somewhat rough and irregular verse of Lucretius was a better medium for the expression of thought that sought to grasp the indefinite and infinite in things, than the strictly artistic Virgilian line. Vividness of finished detail, precision of outline, completeness of portraiture,—these are characteristic of Virgil's thought and verse; but power, space, and time cannot be altogether definitely grasped. They are the grounds of infinite suggestions; the mind is stirred and left working on the process of the world; and we may thus expect a style less ornate and



finished, alike in diction and in structure, than that of the later poet. But with all this, there is no one in the whole series of ancient Roman writers, in poetry or prose, who can be placed alongside of Lucretius, for the union of high speculative power, deep moral earnestness, and imagination that rises to the loftiest reaches of awe and grandeur.

The poem is indeed a type in the world of thought of the irrepressible Roman spirit of absolute sovereignty and love of orderly rule in the world of practical life and action. The speculative poet wished to hold in the comprehensive grasp of his conquering thought the seemingly baffling problem of the rise, the nature, and the limits of the sensible world,—to be its master and lord by knowing the secret of its birth and the uniformity of its processes. He endeavoured to set it within human conception from lowest earth to highest ether: just as the military Cæsar, typifying the self-assertion of the Roman character, sought, by the absoluteness of practical power and action, to be the lord of the known world, to bring it to the unity of supreme control, government, and law, from the Euphrates to the Rhine. And the history of the supposed speculative

conquest of the universe is written in the poem of Lucretius in a manner as clear, full, and rounded off, as the history of the Roman conquest of the world was pictured by the Lord of Fire on the prophetic shield of Æneas. There is in the poet philosopher and in the aggressive military statesman the same striving for completeness, for mastery; the same impatience at fragmentariness; and there is in both the same mechanical limitation of conception and of purpose, which, though successful for the time, must ultimately give way before the quiet workings of deeper political, intellectual, and spiritual forces than were then supposed to be possible in the nature of man and things.

My limits do not allow me to show how Lucretius, in dealing with the phænomena of nature, works out from the beneficent aspects of it to the organically agreeable, and then to the purely aesthetical. This is a very interesting line of inquiry for the growth of imaginative conception and feeling, but I cannot trace it at present. I shall now deal with what seems to me to be most distinctive in the nature-feeling of the poet. This arises from the speculative problem with which he grapples, and the kind of

solution which he adopts; and it consists in an intense sympathy for the grand, and especially the limitless, in power, in space, and in time. He touches with equal readiness and impressiveness the sublime of degree, of expanse, and of duration. No classical poet has done so with greater power; no poet, ancient or modern, has done so with greater frequency and variety.

The problem of the first beginning and the end of things, as he puts it, is:—"Whether there was ever a beginning of the world through a producing cause, and whether there is ever to be an end of it. How long the walls of the world can endure the pressure of violent assaulting motion. Or whether, divinely endowed with eternal security, they are able to glide on in an everlasting course of time, and defy the powerful forces of immeasurable ages."

"Ecquaenam fuerit mundi genialis origo,  
Et simul ecquae sit finis, quoad moenia mundi  
Solliciti motus hunc possint ferre laborem,  
An divinitus aeterna donata salute  
Perpetuo possint aevi labentia tractu  
Inmensi validas aevi contemnere viris."\*

\* *De Rer. Nat.*, V., 1212, *et seq.*

The immensity of space is ever haunting the thought and imagination of the poet, and the contrast of its immeasurableness with the limitation of the sensible sphere, is the spur which pushes his eager inquiry outside and beyond the bounding walls of the world. It is towards that unknown immensity that the mind ever yearns, and into which it seeks to pass "in free and unimpeded flight" :—

“Quaerit enim rationem animus, cum summa loci sit  
 Infinita foris haec extra moenia mundi,  
 Quid sit ibi porro quo prospicere usque velit mens  
 Atque animi jactus liber quo pervolet ipse.”\*

The notion of the ~~limitless is everywhere present~~ as the speculative element,—the grounding idea of his theory of the universe. But the infinity of time is comparatively subordinate to the immensity of space, for the latter is needed as the condition—the room, in fact—for power and time to work out their results. And this immeasurableness of space is also the frame-work of his imaginative representations. The void of abstract thought becomes the vivid concrete of the pictorial imagination. There is hardly a grand imaginative passage in the poem in which you cannot

\* *De Rer. Nat.*, II., 1044, *et seq.*

detect visual space as the ground-work,—transcending grasp, yet clothed and gleaming in real presence.

In many of the passages, it is the sole or the emphatic element. Now space is such that the swift bright thunderbolt, gliding on in luminous race through infinite time, would fail to course through it, or in the least lessen what remains:—

“ Est igitur natura loci spatiumque profundi,  
 Quod neque clara suo percurrere fulmina cursu  
 Perpetuo possint aevi labentia tractu  
 Nec prorsum facere ut restet minus ire meando.” \*

We have the clouds sounding over the plains of the wide-spreading upper world—

“ Dant etiam sonitum patuli super aequora mundi.” †

We have the autumn time, when the house of heaven, set with glittering stars, and the whole earth are shaken all around—

“ Autumnoque magis stellis fulgentibus apta  
 Concutitur caeli domus undique totaque tellus.” ‡

And we have “the winds carrying the thinly scattered

\* *De Rer. Nat.*, I., 1002, *et seq.*

† *Ibid.*, VI., 108.

‡ VI., 357.

clouds across heaven in the night-time, and the glittering signs appearing to glide athwart the rack, and travelling on high in a direction different to their real course"—\*

“Raraque per caelum cum venti nubila portant  
Tempore nocturno, tum splendida signa videntur  
Labier adversum nimbos atque ire superne  
Longe aliam in partem ac vera ratione feruntur.”

We have it in the dark-blue of the great universe—

“Magni per caerulea mundi.”†

The vast azure level of ocean—

“Maxuma qua nunc se ponti plaga caerulea tendit.”‡

There is the all-illuminating sun—

“Sol omnia lustrans.”§

In that wonderfully powerful passage in which he points out the influence of familiarity in abating admiration, we are asked “to look up and suppose we saw for the first time the clear and spotless hue of heaven, and the stars which it holds within it

\* *De Rer. Nat.*, IV., 443. Mr. Munro's rendering.

† *Ibid.*, V., 771. ‡ V. 481. § VI., 735.

wandering all about, and the moon, and the lustre of the sun of surpassing brightness":—

"Suspicio caeli clarum purumque colorem,  
Quaeque in se cohibet, palantia sidera passim,  
Lunamque et solis praeclara luce nitorem."\*

The power of the invocation to "Alma Venus" depends mainly on expanse clothed, filled, living, and the sense of hurrying movement in space:—"Before thee, goddess, flee the winds, the clouds of heaven; for thee earth manifold in works puts forth sweet-smelling flowers; for thee the levels of the sea do laugh, and heaven propitiated shines with outspread light. . . . The wild herds bound over the glad pastures and swim the rapid rivers. . . . Yes, throughout seas and mountains and sweeping rivers, and leafy homes of birds and grassy plains, striking fond love in the breasts of all, thou constrainest them each after its kind to continue their races with desire." †.

"Te, dea, te fugiunt venti, te nubila caeli  
Adventumque tuum, tibi suavis daedala tellus  
Summittit flores, tibi rident aequora ponti,  
Placatumque nitet diffuso lumine caelum.  
. . . . .

\* *De Rer. Nat.*, II., 1030, *et seq.*

† *Ibid.*, I., 6, *et seq.* Mr. Munro's rendering.

Inde ferae pecudes persultant pabula laeta  
Et rapidos tranant amnis.

Denique per maria ac montis fluviosque rapacis  
Frondiverasque domos avium camposque virentis  
Omnibus incutiens blandum per pectora amorem,  
Efficis ut cupide generatim saecula propagent."

Lucretius, naturalistic as he is, is thus among the least sensuous of poets; he is one who, for effect on the imagination, depends but little on mere organic feeling, whether the definitely sensational or the generally agreeable, and greatly on intellectual conception made vivid to sense. The element of organic feeling certainly enters into his picturing of nature, and enters truly and impressively; but it is not that which has inspired his highest imaginative efforts.\*

The principles which Lucretius lays down, and the assumptions which he makes with a view to account for the origin of the world, all touch the imagination on the same side—that of the feeling of the limitless. The atom, indeed, the primordium,—that ultimate beyond which intelligence cannot and need not go, to solve the origin of earth, sea, and heavens,—is an

\* For a discriminating and appreciative estimate of the genius and style of Lucretius, I need hardly refer to the well-known and admirable work of Professor Sellar, on *The Roman Poets of the Republic*.



absolute or indivisible minimum. It can neither be generated nor dissolved in time. It is an everlasting solid singular, absolutely incompressible, or without internal void.\* It has no sensational quality—neither colour, taste, smell, nor sound—it is invisible. Yet it is capable of motion and impact, and thus of producing all our manifold sensations. In variety of shape the primordia are limited, but in number of individuals in each kind of shape they are infinite.† Their motion is possible through the existence of void or free unresisting space. Atom and void are the ultimate grounds of the universe. Nothing exists except these, and what comes out of them. As space is infinite, there is no centre or lowest point at which the atoms might rest in position. They are for ever streaming on through space on all sides, and are supplied from its unfathomable depths; and they have been moving both of themselves,—by their own weight,—and by mutual impact through endless time. At length the first elements, after testing every kind of production possible

\* *De Rer. Nat.*, I., 510.

† *Ibid.*, II., 478, 523. Mr. Tyndall, in his summary of the atomic theory (*Address*, p. 4), makes the assertion that the variety of shapes of the primordia is infinite. This was the doctrine of Democritus (*Laert.*, ix., 7, 12), but it was repudiated both by Epicurus (*Ibid.*, x., 1, 24) and Lucretius.



by their mutual combinations, suddenly met together in masses that were the rudiments of earth, sea, and heaven, and the race of living things, very much as the rude chaos of brute force—the original sphere of man—settled at length into civilised society, spontaneously ruled by the sense of law and order, after the exhaustion of physical violence overdone in assault and repression.\* These rudiments “after a strange, stormy crisis, and medley,” finally righted themselves and constituted the orderly world we now see. The different combinations of the primordia, effected through motion, constitute and explain the variety of things in the sensible world.

The original state of our world would thus seem to be an aggregate of atoms loosely thrown together within a definite portion or limit of space, as the result of the great atomic whirl that had been going on in the measureless void. Among the atoms there is difference of shape, size, and weight. The weight of each atom determines its downward perpendicular motion through the void, and, as void is unresisting, each falls with an equal velocity. Why, then, it may be asked, do they not go on for ever in this downward

\* *De Rer. Nat.*, V., 925, *et seq.*

direction through the infinity of space? The answer is, that swerving somehow from the parallel lines of their falling paths, there is impact and rebound. The lighter atoms are thus forced upwards, and form ether,—the highest sphere,—with its great rolling fires girdling the world. From other motions upwards of atoms not so light as the ethereal, there arise the sun and moon, whose spheres revolve in the air midway between earth and ether. After these were formed, the other grosser atoms coalesced and formed the earth.\*

In a word, the genesis of things, as Lucretius puts it, is that of the limitless yet definite atomic first beginnings moving through the immeasurable void, during immeasurable time, finally clothing themselves with limit of sensible form, and passing into the orderly world we now know. The atoms have varied shapes and weights; motion and impact after endless revolutions give them definiteness of sensible form and position. The rudiments of things are a synthesis of the infinite and absolute—the infinity of number and motions in time, and the absolute of minimum or constitution. The fixity or limit arises out of a conflict between the infinite sweep of atomic

\* *De Rer. Nat.*, II., 216, *et seq.*, 251, *et seq.*, V., 416, *et seq.*

power, and the definite constitution of its parts or atoms. The world of our experience is, as it were, the unlimited and the limited conciliated in temporary unity. Power, in one respect, vast, immeasurable, yet mastered by itself in the progress of its evolution,—the limitless self-limited,—the indefinite become definite,—order blossoming on chaos,—this, whatever be its speculative worth, is imaginatively one of the grandest forms of the sublime. It is an analogue of that highest of our conceptions, an absolute will, conscious of itself and its powers, and yet holding all within the grasp of self-mastery and self-control.

In this system, which has arisen out of mere conjunction, there is, nevertheless, the presence and operation of definite causes, subject to necessity of law and nature, which work out perfectly definite effects. Being, which begins, cannot arise from nothing. Change implies cause; and anything cannot be the cause of anything whatever: for causes have special natures or powers, and thus work out special results or effects.\* So far at least as the outward world is concerned, the successive evolutions manifested in it are subject to law and necessity. “In all

\* *De Rer. Nat.*, I., 159, 173.

things we observe much which takes place at a fixed time. Trees have a set time for blossoming, and for shedding their blossoms. . . . When the first beginnings of causes have been in this way, and things have thus happened from the first rise of the world, in due sequence too they now recur after a definite order."

"Multa videmus enim, certo quae tempore fiunt  
Omnibus in rebus : florescunt tempore certo  
Arbusta et certo dimittunt tempore florem.

Namque ubi sic fuerunt causarum exordia prima,  
Atque ita res mundi cecidere ab origine prima,  
Consequē quoque jam redeunt ex ordine certo.\*

When we have, therefore, a cause whose operation is known, we may confidently expect the particular effect. The world is thus a system of order—of uniform, predictable occurrences.

On this point Lucretius is greatly in advance of Hume; for the former thus grounds the order of things on the fixity of objective conditions, as opposed to a merely common and repeated subjective experience. Instead of mere conjunction stereotyped in habit—a simple unguaranteed constancy of impression—there is the notion of outward determining

\* *De Rer. Nat.*, V., 699, *et seq.*



principle and law. The identification of physical causality with antecedence and consequence, however qualified by epithets, is a legacy of Hume to Brown and the Mills. It has done as much as most inadequate conceptions, when set up as complete, to pervert philosophical thought. As an expression of moral causality, where the agency and the consciousness of it are identical, it utterly fails. Even as an expression of physical causality, it is incomplete. Physical change can be adequately conceived only by regarding the antecedent as passing or being transformed into the consequent or effect,—as the stored up power of the gun-powder passes into the motion of the ball, or the dammed up water of the still pool is transformed into the actual force of the waterfall. Invariable antecedence may be taken as a test of the visible or phænomenal cause, or of the cause in this aspect; it is thus a help to prediction; but it is not an adequate expression of physical causality. Physical change really means transformation of force in faculty or potency into act, or work,—the latent passing into the actual, or the actual again transforming itself into the latent or potential. The explicit processes of science have now confirmed and illumined the natural

instinctive sense of cause or power, in regard to the sensible universe. In this respect, the view of Lucretius regarding a definite nature in causes, and corresponding distinctive results, fits perfectly with the conception of effects varying with varying classes and kinds of potency of work in things.

This notion of uniform and predictable order, as stated by Lucretius, was doubtless a great point gained for the thought and feeling of the time. It was of the highest importance to reach the idea of a definite order in things, for it gave men courage in a certain mastery over nature,—the courage of faith in the future,—the conviction that that future was not at the bidding of wholly capricious powers, of which men knew nothing except from their supposed effects—their lawlessness, and tendency to interfere through passion with the course of things. There was here a firm basis for human thought and human action—for foresight, prudence, and manly self-reliance. It was man asserting himself against the supposed control of a class of invisible powers, which his reflection taught him were unworthy, morally and intellectually, of his better thoughts.

But what of the permanency of individual life, and

what of the stability of this system of our experience, which has thus arisen ?

The objects of our experience—the causes and effects at work in the world—are made up of the coming together of the first bodies, the seeds of things. Neither individually, nor as a whole, is the system permanent, everlasting. The earth is the mother of the individual objects upon it ; it is also their tomb. And, as the whole system had a birth, it will pass through decay to death. Individual objects are constantly exposed to the wear and tear of the supersensible primordia which are in perpetual aggressive motion. So long as they are able to take from the constant flow around them more than they give, they live and grow ; but this has its limit. And the moment the limit is reached, then they begin to decay, to succumb to the attacks on “the fastnesses of life,” and finally to perish. The powers of primordial motion, which originally gave them being, are really constantly assaulting that being—their own gift. Objects are real in so far as they have limit ; but whenever a thing quits its proper limit, and is thus changed,—say by the loss of any of its constituent primordia,—immediately this change of



state is the death of that which was before. The death of anything is thus the violation of the limit which constitutes its unity.

“Mutat enim mundi naturam totius aetas  
Ex alioque alius status excipere omnia debet,  
Nec manet ulla sui similis res : omnia migrant,  
Omnia commutat natura et vertere cogit.”\*

“Nam quodcumque suis mutatum finibus exit,  
Continuo hoc mors est illius quod fuit ante.”†

But while this change is constantly going on, while individual objects are growing only to decay and perish, they are as regularly constituted in new forms. The elements which forsake each thing lessen the thing from which they go, and thus leave it to perish, but they increase that to which they come, enable it to grow, and thus constitute new beings. As the former grow old, the latter come to their prime. These again go through the same process of change. The individual withers and dies, but only to result in a new form of life.‡

This ceaseless cycle of life and death is imaginatively one of the most powerful and pathetic concep-

\* *De Rer. Nat.*, V., 828, *et seq.* † *Ibid.*, II., 753.

‡ II., 67, *et seq.*

tions of the poet. Infinite time, boundless space, are fused in action and relation, and amid them emerge the sensible changes of life and death. These are but the pulsings of everlasting movement. "Death-dealing motions cannot always keep the mastery, nor entomb existence for evermore. Nor, on the other hand, can the birth and increase giving motions of things preserve them always after they are born. Thus the war of first beginnings, waged from eternity, is carried on with dubious issue: now here, now there, the life-bringing elements of things get the mastery, and are overmastered in turn: with the funeral wail blends the cry which babies raise when they enter the borders of light, and no night ever followed day, or morning night, that heard not, mingling with the sickly infant's cries, wailings, the attendants on death and black funeral."\*

And what is true of individual life holds also of the whole system of things. By the aggressive blows which finally destroy individual objects, "the walls of the great world around shall be stormed and fall to decay and crumbling ruin." We have even now indications of the decay of the productive powers of

\* *De Rer. Nat.*, II., 569, *et seq.* Mr. Munro's rendering.

the earth,—of that earth which from the accumulation of diverse seeds at first gave birth to “goodly crops and joyous vineyards,—sweet fruits and glad pastures.” That which at first produced can now but imperfectly sustain. “The sorrowful planter of the exhausted and shrivelled vine impeaches the march of time and wearies heaven, and comprehends not that all things are gradually wasting away and passing to the grave, quite forspent by age and length of days.”\*

The passage in the Fifth Book (l. 364, *et seq.*) in which the poet expresses this view, is one of the most powerful and characteristic in the poem. I have tried thus to render it :—

The world is not a solid unity,  
Imperishable ; there is void in things ;  
But not mere void ; and bodies fail not that  
Perchance may rise out of infinity,  
And in strong sweep of eddying whirl o'erthrow  
The sum of things, or down upon it clash  
Some other perilous disaster dire ;  
Nor does there fail the space of deep profound,  
Wherein to broad-cast ruin down may sink  
The world's walls : they by other force assailed  
May perish. Think not then the gate of death

\* *De Rer. Nat.*, II., 1148, *et seq.* Mr. Munro's rendering.

Is closed against the heavens, the sun, or earth,  
 Or deep flow of the sea ; it aye, with vast  
 Wide open gape, stands waiting for the world.  
 If things may die, they also had a birth,  
 For mortal frame was ne'er compact enough  
 To spurn back through infinite time till now  
 The powerful strain of ages limitless.

“ At neque, uti docui, solido cum corpore mundi  
 Naturast, quoniam admixtumst in rebus inane,  
 Nec tamen est ut inane, neque autem corpora desunt,  
 Ex infinito quae possint forte coorta  
 Corruere hanc rerum violento turbine summam  
 Aut aliam quamvis cladem importare pericli,  
 Nec porro natura loci spatiumque profundi  
 Deficit, exspargi quo possint moenia mundi,  
 Aut alia quavis possunt vi pulsa perire ;  
 Haut igitur leti praeclusa est janua caelo  
 Nec soli terraeque neque altis aequoris undis  
 Sed patet immani et vasto respectat hiatu.  
 Quare etiam nativa necessumst confiteare  
 Haec eadem ; neque enim, mortali corpore quae sunt  
 Ex infinito jam tempore adhuc potuissent  
 Inmensi validas aevi contemnere vires.” \*

But let the present order of things—its spatial and temporal unity—be destroyed, nothing would absolutely perish. No object of our experience is annihilated. The things which die are simply resolved into the elements out of which they sprung—into those imperishable primordia beyond which dissolution can-

\* *De Rer. Nat.*, V., 364, *et seq.*

not go, into what, in fact, is the first and last of things. Had there not been this imperishableness in the elements of things, infinite time would long ago have been too strong for the system of the world, and would have utterly swept it away. But even infinity is impotent against the barrier of the absolute atomic limit. While there is a sensible change in the things of our experience, there is yet no absolute loss to the universe. The individual withers and dies, the present order is dissolved, but the grand sum of existence is never lessened a jot, and its powers are free to turn again towards new evolutions.

Lucretius has, in his conception of atomic transition from individual to individual through the changes of life and death, very closely anticipated the root idea of the modern doctrine of the Transformation of Energy; as his view of the impossibility of the annihilation of the primordia, and the absolute undiminishableness of the sum of matter, is explicitly that of the Conservation of Matter. There is not any form of being, according to him, which goes back to nothing. Things when broken up return into the prime constituent elements of matter. His picture of transformation is most powerful, vivid, and com-

plete. Father Ether sends down the rains into the lap of mother Earth; goodly crops spring up, and the boughs of trees put on their greenery of leafage, the trees increase and bear fruit; man and the race of wild beasts are nourished; joyous towns are prosperous with children; and leafy forests ring throughout with the new songs of birds; the cattle yield milk, and their young, heart-delighted with the new milk, gambol over the soft grass.

“Haud igitur redit ad nilum res ulla, sed omnes  
 Discidio redeunt in corpōra material.  
 Postremo pereunt imbres, ubi eos pater aether  
 In gremium matris terrai praecipitavit;  
 At nitidae surgunt fruges ramique virescunt  
 Arboribus, crescunt ipsae fetuque gravantur;  
 Hinc alitur porro nostrum genus atque ferarum,  
 Hinc laetas urbes pueris florere videmus  
 Frondiferasque novis avibus canere undique silvas;  
 Hinc fessae pecudes pingui per pabula laeta  
 Corpora deponunt et candens lacteus ūmor  
 Uberibus manat distentis; hinc nova proles  
 Artubus informis teneras lasciva<sup>o</sup> per herbas  
 Ludit lacte mero mentes perculsa novellas.  
 Haud igitur penitus pereunt quaecunque videntur,  
 Quando alid ex alio reficit natura nec ullam  
 Rem gigni patitur nisi morte adjuta aliena.”\*

What Lucretius put, on imperfect grounds certainly,

\* *De Rer. Nat.*, I., 248-264.

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in regard to the origin and end of the sensible world, modern science, according to its present knowledge or assumptions, generally approves. The present visible or sensible system had a beginning in time ; its early, if not its absolutely first stage, was the atomic ; it is decaying ; it will have an end. The sun, the great centre of light and heat, and of the conditions of life, is not a power of ever during resource, and it is physically a wasteful source of energy. While it is sustaining a limited life on our globe, and it may be on other planets, it is at the same time prodigally dissipating its heat-energy through space,—not to be recalled by it for use. As its power of radiating heat decreases, finally to perish, and as the earth and other planets are more and more impeded in their orbital motion by the resistance of the ether, the time is gradually approaching when the whole planetary system will collapse, and be absorbed in one effete darkened mass of matter, or dissipated into energy amid ethereal space. There will be disaster, ruin, dissipation, without absolute destruction or annihilation of material. Lucretius, if modern science be correct, was a true prophet, though his prediction was rather a forecast than a deduction.

Such is in outline the atomic doctrine as put by Lucretius. It obviously professes to be an answer to the question as to what matter, or the material world, is in its ultimate reality. Through the history of philosophy we can trace two views on this point which have been usually regarded as antagonistic to each other. There is the view of the ultimate divisibility of the elementary particles of bodies, attributed both to Empedocles and Anaxagoras in antiquity. This doctrine may be interpreted as meaning that the ultimate elements of a body are entirely similar in character to the whole. Pursue the analysis of any body whatever back to its primary constituents, and you will find only parts in space that are absolutely impenetrable—that is, incapable of being squeezed altogether out of space, and capable at the same time of infinite divisibility, at least in thought.

But to this there has been always a counter view. The ultimate elements of bodies are not absolutely alike. As the compounds differ, so do the elements. They vary in shape, size, and weight. Moreover, they are absolutely indivisible,—physically and conceptually. They are atoms. They are everlasting, imperishable, indestructible. This was generally the



atomic view of Democritus, Epicurus, and Lucretius. And it is now, with certain modifications and additions, the prevailing doctrine of physicists.

The chief modification which the theory of Lucretius has undergone in modern times is as to the supposed impenetrable hardness of the atomic element. For this feature of the atom is substituted that of an absolute mobility, so that it cannot be conceivably fixed and cloven. This is called the theory of vortex-ring atoms, and matter is thus ultimately supposed, as by Sir William Thomson, to consist of "the rotating portions of a perfect fluid, which continuously fills space." It is obvious, I think, that the very terms of this hypothesis preclude our accepting the vortex-ring atoms as the ultimate of matter. We have as its ground the perfectly continuous fluid, which is space—filling, and therefore essentially physical; and we have the supposed development of the vortex-rings out of it. What and whence is this fluid, which is before the atomic sphere? Is it not really, on this view, the ultimate in matter,—the vortex-ring atom being but the pen-ultimate of things? Then it seems that there are physical difficulties connected with the origin of motion among



certain of the particles of a fluid of the kind described. It is said that "rotation can only be produced or destroyed in a fluid in virtue of its viscosity (or internal friction), and in a perfect fluid there is nothing of the kind."\*

In some criticisms of the feature of the Lucretian atom as of impenetrable hardness, there seems to me to be a confusion between two very different notions,—viz., physical hardness and ultimate impenetrability. Hardness is simply a form or degree of resistance to pressure. An atom as absolutely hard in this sense would be what is incapable of being lessened by pressure in its space-filling property. But there may be impenetrability, or better, incompressibility, even if the atom were conceived absolutely mobile. For the most mobile atom, in order to be at all, must fill a certain amount of space, and it cannot possibly be conceived by us as capable of being so compressed as still to be and yet leave space wholly void,—in other words, each atom must ultimately be regarded as absolutely incompressible.

\* *The Unseen Universe*, p. 104. The references to this work have been inserted since the address was delivered. It was not published at the time the address was given.

The atomic hypothesis, as advanced by Lucretius, is necessarily very weak in regard to the principles of combination among the atoms. There is difference of shape, of size, and of weight, and there is a downward perpendicular motion attributed to weight. There is further an upward motion of the lighter atoms due to impact and rebound ; and this arises from a swerving of the descending atoms from the parallelism of their falling paths. There are also entanglements among the atoms, through hooks and claws. These conceptions are obviously simply and rudely mechanical. They may be taken as at the utmost very dim foreshadowings of gravity and cohesion. The ideas of polar attraction and repulsion, and of chemical affinity, have no place. Atomic motion of the kind supposed would give at the best only aggregates of particles. Composition in any proper sense is not provided for. The variety of forms and kinds of things in our experience could only irrationally be regarded as due to primitive conditions of being so rudely and imperfectly conceived. Lucretius, indeed, seems to entertain the conception of additions being made to the world since its first production, from the ceaseless atomic whirl going on around it on all sides, and of

bodies being thus added each to its appropriate class or kind,—as moisture to moisture, and fire to fire,—simply by blows.\* But this is obviously attributing results to a cause wholly inadequate. The ideas, moreover, of class and limit of growth, or organism, which is simply growth under limit, are presupposed.

The question regarding the conceivability of the atom has been raised; and I have seen it argued that an atom as a piece of matter has necessarily length and breadth, and that thus at the same time to regard it as indivisible is contradictory. I confess I do not set much store on argument of this sort. There are two distinct senses of the term indivisible, and these senses do not appear to me to be incompatible. An atom, as a point in space, is no doubt *quantitatively* divisible—that is, if we conceive or image it at all, it will be possibly separable in thought. But then, at the same time, it may be *qualitatively* indivisible. In other words, no possible analysis, real or conceptual, may be able to get out of it anything but one homogeneous unity,—itself and nothing else. And it is in this latter sense that the atom is properly spoken of as absolutely indivisible. There is thus, as appears to me, no

\* *De Rer. Nat.* II., 1105, *et seq.*

real incompatibility between the doctrine of ultimate divisibility and that of the atomists. The notion that the ultimate elements of body are simply the absolutely impenetrable,—what cannot be squeezed out of space or being,—and that they are capable at the same time of infinite divisibility, at least in thought, is not necessarily antagonistic to the Lucretian or atomic, if we take in distinctly the conception of *qualitative* indivisibility. The ideal divisibility of anything occupying space is always possible, but this is not repugnant to the notion of the complete integrity of the quality or definite nature of the thing. In fact, the two notions must go together to constitute a total thought of the object.

There is a further confusion of thought on this point. Two questions are mixed together. Whether we are able absolutely to isolate an atom from everything else, from its compounds, and make it an object of direct apprehension by itself, is one question ; whether we are compelled to infer its existence from matter of observation and experience as an element of what now exists, is another question. We may be able to determine the latter in the affirmative ; we may be compelled to determine the former



in the negative. In thinking individuals, we think them as embodiments of general ideas, and therefore we think the general idea in and along with them; but we cannot conceive either the individual or the general idea by itself, or as anything but the concurrent element in a complex knowledge. Yet each is needed for the thought of the other. So may the thought of atomic elements be needed for the thought of the compound body, when we make progress in analysis of it. This really seems to be the proper inference from Dalton's *Law of Combination in Multiple Proportions*. Dalton found by experiment "That bodies are capable of combining with one another, in one proportion by weight, in twice that proportion, in three times that proportion, and so on, but in no intermediate proportion." The inferences from this were that there are atoms, that the atom of each elementary body has a fixed weight, which differs from that of the atom of any other elementary body.\* But these atoms are not by themselves objects of sense; they are inferred as the constituents of the existing elementary bodies. We thus know them simply as terms of a relation. All that the law

\* See Professor Roscoe on *The Atomic Theory*.

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establishes is that atomic elements, which cannot be transformed into others, yet form compounds with other heterogeneous atomic elements, according to certain definite conditions of combination; and thus give results different from themselves taken separately.

But this does not render the atoms in any case themselves objects of sense or apprehension, much less does it throw any light on the mode of the supposed original combination of the elementary bodies. It gives the law according to which these combine in our experience, and according to which they will universally combine, if brought together within certain limits. But as to how, supposing all atomic elements to have been originally separate, they acquired such collocation as to be able to combine even into the elementary molecular masses, it says nothing.

Of course, I do not dispute the assumption that, under certain very high degrees of heat, it would be possible to reduce any hitherto unresolved elementary body into its atomic elements. We might thus go back to the molecule of a body, that is, to the least part that is homogeneous with the whole, and this molecule, if compound, might be further reduced into

its constituent heterogeneous atoms,—as a molecule of sand into silicon and oxygen, which are supposed to be composed of ultimate elements or atoms. But in this analysis nothing, whether molecule or atom, would ever become an object of sense or direct observation. Nor could we so isolate the atom as to learn absolutely its weight or properties. Our whole knowledge of it would still be relative; it would be regarded as of this or that weight or property, when we conceived it as ideally combined with other heterogeneous atoms.\*

The question of course may be raised, looking at the fact of the existence of atoms, as to whether there are any grounds for supposing anything beyond them. We are said to find them, or rather to be led back to them, as existing and in constant motion. They are, each of them, according to the modern conception, endowed with a force or forces,—gravitating, cohesive, chemical. They are, in their different kinds, identical in character, in weight, and in properties. All over the universe this identity holds, whether we analyse back to them in air, on earth,

\* See a curious passage in Lucretius, *De. Rer. Nat.*, I., 598, *et seq.*, in which he seems to approximate to this view.



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or in the other bodies of the planetary system. They are definite quantities, capable of combination only in definite and ascertained numerical relations. Each, as it were, has been weighed and measured, ere it was set afloat on the vast inane. The question arises—Are they eternal? Or were they originated in time? If so, what was before them? Were they evolved out of prior atoms or elements? Or are they the disintegrated elements of a former system, itself the last of an indefinite series? Or were they called into being by a creative *fiat*?

It may be said, perhaps, that so far as science goes there is no answer to such a question. Science as observational, inductive, and inferential, deals with the actual and the unobserved phænomenal. But as the atoms are apparently the last things which it can reach, even by inference from the observed, it has no warrant to go further. Besides, these atoms seem to baffle the notions of antecedence and evolution. They are identical; they are self-convertible. Analysed, nothing comes out of them save themselves. It is no help to suppose that they came from antecedent selves like them. For whence, it may be asked, came these? And why do they arbitrarily change from

self in time to self in time? Evolved they cannot be, for evolution supposes other elements not yet combined, which make the composite. But they are not plural in elements; they are not composite at all. They are single, identical, absolute units, incapable of transformation. They seem not to fall under the conception of physical law. They have neither antecedents, nor are they evolved according to natural conditions. They are in truth the presuppositions of natural law itself. Are we here, then, face to face with the ultimate of things? Is this, the last point for human analysis, also the ultimate resting-place of human thought? Is the Godhead of the universe finally resolved, not into a trinity of persons, but into a multiplicity of gods in the shape of the unresolvable atomic elements?

In an able and instructive work, entitled *The Unseen Universe*, which has been published since this address was delivered, and while it was passing through the press, an attempt is made to show, on principles of natural law, that the atom must have an antecedent physical condition, which connects it with a preceding invisible universe or sphere. This attempt seems to me to be unsuccessful. The con-

clusion aimed at may or may not be true ; but the process of proof is a bad one.

The principle upon which the inferential or speculative theory of this work is founded is called by its authors the Law of Continuity. It would have been well had they taken pains both to define this law and to show the grounds of it. Instead of doing either of these things, they treat us to an "illustration" of the principle in the case of the history of Astronomy, in the course of which it is shown how sensible anomalies in regard to the heavenly bodies and the earth disappear before increasing science ; how apparent breaks in the regularity of their phænomenal aspects are found not to be real ones, and how at length the whole planetary system is found to obey Kepler's laws of motion, in virtue of the great principle of gravity. A breach of Continuity would be exemplified if the sun, moon, and stars were to move about in strange and fantastic orbits during a day, and then return to their previous places. This, apart from physical disaster, would plunge the whole intelligent universe into irretrievable mental confusion. The production of such a state of mind is a true test of a breach of this law. "Continuity does not preclude

the occurrence of strange, abrupt, unforeseen events in the history of the universe, but only of such events as must finally and for ever put to confusion the intelligent beings who regard them." \* We are further told that a single apparent exception to the usual procedure may be supposed to occur, if it be allowed that this may be made use of in order to deduce from it the great general law of working, which includes both the usual course and the apparent exception.†

We might suppose from this account of the principle that it is another name for that of Physical Order, or the uniformity of antecedent and consequent in experience. It is, however, more than this. It implies continuous transformation of physical antecedent into consequent, through all time without break or direct interference by the creative power of Deity. And its application by the authors of *The Unseen Universe* involves a great deal more than this principle in any form can warrant. For not only does the Law of Continuity, as applied by them, imply an unbroken series of conditioned and conditioning in the visible or physical universe of our experience,—which goes back probably to a first

\* *The Unseen Universe*, Art. 62-76. † *Ibid.*, Art. 81.

atom, or to a germ of life, and is marked by gradual evolution and development in time; but it is said to warrant the position that the rise or first appearance of this germ is itself to be referred not to an act of creation, but to a physical condition previously existing in an invisible universe or super-sensible sphere of being. An act of creation in time,—an act, as they call it, of the Unconditioned, would be a break of continuity. The first atom, or first germ of life—both apparent breaks of continuity—arose out of a previous form of being, invisible it may be,—out of this alone, or guided by some conditioned intelligence, but not from a direct act of the Unconditioned, or Deity. This prime creative act must be supposed to have taken place behind and beyond the invisible sphere, or spheres, out of which arose the primordium of the visible universe. It belongs to Eternity, not to Time. “We think it,” say they, “not so much the right or privilege as the bounden duty of the man of science to put back the direct interference of the Great First Cause—the Unconditioned—as far as he possibly can in time.”\* The principle of continuity “asserts that we shall

\* *Unseen Universe*, p. 132.

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never be carried on from the conditioned to the Unconditioned, but only from one order of the fully conditioned to another."\*

Then, looking to the continuous course of the visible or experienced universe, apparent breaches of continuity, such as the events in the life of Christ, the first appearance of life on the globe, and the production of man, are not real ones. Their seeming to be so arises from our limited view of what the universe is, or in supposing the visible universe to be the whole. In the sphere of Matter and Energy, and in that of Life, the principle of continuity precludes separate creations, that is, passing from the conditioned to the unconditioned. There is an invisible universe bordering this visible, as there is an invisible universe grounding it, and miracle and life and mind are simply a passing of the energy of this invisible sphere into the visible. The law of continuity further demands that this visible universe shall not be destroyed or annihilated. It will, no doubt, perish in time. The whole planetary system will pass into one homogeneous effete mass, or, more probably, its energy will be dissipated amid the ether of space ;

\* *Unseen Universe*, p. 188.

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but this will not be annihilation, only a simple absorption of the visible in the invisible or supersensible universe.

Now, I think it is perfectly obvious that no experience of ours can warrant a principle of such extensive application as this is supposed to be. We may find in our experience the most constant uniformity of antecedent and consequent,—of condition and conditioned,—and we may thus be entitled to infer for the future that this uniformity will subsist in time, as it has subsisted in time. We may even find in experience that condition means a material antecedent, using this phrase in the widest sense as a form either of mass or of energy, and that the conditioned is really always transformed energy,—the potential energy passing into the actual, or the actual being transmuted in various ways. But any generalisation of this sort would apply only to apparent beginning and succession of things in time,—that is, to phænomenal sequence. We can expect, with a high degree of probability, that, given antecedents or conditions similar to those which we have observed, we shall experience similar conditionates or

consequents in the as yet unobserved ; but this is simply the unobserved phænomenal world,—the world of succession in time. In other words, if the world lasts, our experience will be so and so. That is all we are entitled to say. But as to whether and how the world began,—whether and how atom arose,—the most complete sense of continuity in our experience will never enlighten us. It cannot assure us that the atom arose out of a previous antecedent or condition in time, for the simple reason that it cannot, in the first case, tell us whether the atom had a beginning in time or not. If the atom has always been,—if it has never been generated at all,—there is no need of supposing an antecedent or condition of it in an invisible sphere. And the fact that we in our experience find antecedents uniformly passing into consequents,—find things that apparently begin in time working in a uniform way,—can never assure us that things or atoms about which we do not *per se*, or by direct experience, know whether they began to be or not, are related to a previous determining antecedent or condition. Besides, the principle of continuity supposes a transmutation of antecedent into consequent, or condition into conditioned. Can the atom,



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which is incapable of being transformed into anything but itself, that is, of being transformed at all, be supposed as itself a stage in the process of continuity, which means constant transmutation of antecedent into consequent? Out of what sort of material antecedent could that come which cannot be transformed into a different material or consequent, which, in fact, defies in itself all possibility of change? We are here obviously at the very ground of physical law, at a point where the conception of it disappears in conditions necessary to, yet alien from, itself. I do not, of course, maintain that the atom is eternal, but I do maintain that the so-called Principle of Continuity, as thus grounded and applied, is utterly impotent to tell us that it is not, or that it must have had its origin in a conditioned invisible universe, or, indeed, to tell us anything whatever about its origin.

Nor is it manifest how the so-called Law of Continuity can guarantee to us the continuance of the visible universe in some form of matter or transformed energy. The law only postulates that no break shall take place in physical development in time,—in the transformation of one kind of force into another. But this, even if admitted, cannot guarantee that the

material,—the matter or energy,—of the world will subsist in a future sphere and under different circumstances. The fact that this material observes a certain order of transmutation in our experience, does not guarantee anything regarding the indestructibility of the sum of it, after our experience has ceased—after, in a word, the collapse of the present order of things. We are not able probably to conceive uncaused commencement, or absolute termination of being, but this inability assuredly does not arise from the so-called law of continuity.

The true state of the case is that we have experience of the transmutation in several instances of one form of energy into another, where none is lost, but is known to be re-transmutable. We have at the same time the transmutation of various forms of energy into another, viz., heat, where, in most, if not in all cases, a portion of the original is lost or dissipated, and is not re-transmutable. We thus do not know, and cannot affirm, from experience, that in this case no energy is absolutely lost. Apparently, or phæ-nomenally, when energy takes the form of heat, some part of it disappears. We cannot of course say that this portion has absolutely passed out of being, be-

cause it is no longer sensible. But then we are no more entitled to assert, on the other hand, simply from our experience of the other forms of continuity, that it is not absolutely lost. We have continuity, or continuous transmutation of energies; we are also ignorant of the ultimate fate of one of the most constant and persistent forms of it—in fact, of the apparently ultimate form of all energy of motion. We, therefore, cannot positively or dogmatically assert, on an experience of this sort, the absolute continuance of the sum of energy in the universe. We can only say, the moment energy finally ceases to be sensible, that we do not know whether it perishes or not.

The truth is that the Principle or Law of Continuity has not been analysed by the writer or writers who employ it, and it is not properly grounded by them, either on experience or on any higher source of knowledge. As applied by them, it involves the notions of causality, physical order, and transformation of energy. But until it is more definitely grasped, and more thoroughly based, it can yield no definite conclusion regarding the origin or end of things. With the wide extension they give it, it is at the best but an unproved hypothesis. And the facts, as stated

even by its upholders, are rather against than for it. They admit an apparent and unsolved break of continuity in the rise of the visible world in time, in the first appearance of life on our globe, and in the production of man. If there be these, and possibly, as is admitted, other utterly insoluble breaks of continuity in the series of conditionings of the visible universe, in what sense and with what propriety can this so-called principle be laid down as a law of things ?

The only reply we find to this is that the principle of continuity is saved by pushing back the action of the Unconditioned, as they term Deity, to a point or sphere above Time, named Eternity, and postulating a grounding and surrounding invisible universe related to this visible sphere. This invisible universe transfers peculiar forms of energy into the visible world, through the action of conditioned intelligence living in it. In this way they would explain miraculous events in accordance with the law of continuity, and also the appearance of life and mind on the globe. It seems to me that these, as admittedly special effects, or effects that cannot be read as forms of transmuted energy, that is, energy transmuted in the line of physical causation, equally constitute a breach of the Law

of Continuity, whether we refer them to the action of supersensible intelligence subordinate to Deity, or directly to Deity himself. The breach of continuity in such cases consists in the fact, admitted by the writers, that neither miracle, life, nor mind can arise as a transformed state of energy, or be regarded as things occurring naturally in the flow of physical causality, be the cause matter or energy.

We have seen that along with the existence of the atom there is assumed its motion,—motion in space. And it is supposed that the atoms of bodies—solid, liquid, gaseous—are always in motion in varying degrees. Now, the question may be asked—Whence is this motion of these atoms originally? Each is a “potential force.” Is this a force that may pass into motion, or is it a force that must pass into motion? A *potential* force means, I suppose, a *power* or a *capacity* of exercising force—say motion, or of being transformed into motion. Is a power of force a power that *sua sponte* passes into motion? a motion self-originated? tending from one point of space to another? Or is it a capacity of movement, so that when the atom comes within the sphere of the



attraction of another atom, these two atoms move towards each other? Each atom occupies a definite point or part in space. Is it originally fixed there? Or had it never at any time anything but a passing movement from point to point in space? If so, was this movement because of primary self-determining impulse, or did it arise either from the mutual attraction or mutual repulsion of a plurality,—a crowd of existing atoms? Before we can decide the question as to the absolutely primal character of atoms, we must decide these questions. For actual motion is no necessary part of our conception of indivisible points endowed with force existing in space. At any rate, as yet, with such suppositions, we have obviously the vaguest possible chances of the direction, and almost an absolute contingency in respect of definite ends or termination, of movements. How can definite form of blade of grass, or leaf of tree, or bloom of flower, be conceived of rationally as arising simply out of such indefinite contingencies?

We hear a good deal in these days of the phrases "potential energy" and "kinetic energy." They, no doubt, indicate an advance in precision of scientific conceptions; and the departments of science

grounded on them are characterised by a correspondingly greater degree of clearness, distinctness, and symmetry. Energy is a power of doing work, either stored up, as in a body lifted from the ground, or in actual exercise, as in the motion of the ball sent from the cannon. "There are thus," we are told, "two forms of energy which change into one another, the one due to actual motion, and the other to position; the former of these is generally called *kinetic*, and the latter *potential* energy." \*

Such a use of the phrase "potential energy," shows how far modern scientific nomenclature has departed from Greek, and from historical accuracy of expression. The Aristotelic ἐνέργεια is, as is well known, *act*, the realisation or manifestation of δύναμις. It is only vulgar usage which has made it convertible with *power* or *force*. Strictly speaking, "potential energy" is a contradiction in terms. The power of doing act, work, or passing into motion, is of course a potence, potentiality or δύναμις. To join the adjective *potential* to energy, is really to speak of what is done or doing as not yet done or doing.

The Aristotelic ἐνέργεια, energy, is, besides, a

\* *The Unseen Universe*, p. 76.

better word for what is now narrowly called *kinetic energy*. The use of this phrase seems to contemplate power in motion—motion in space, as from point to outer point, or from point to surrounding points. This motion may be visible or invisible. It may be of what has weight or is weightless. Still, there is always supposed the element of motion. But the act of stored power is greatly wider than motion in any form. The power of thought, or, if you choose, the brain-power, may be regarded as a power in store; but it would be exceedingly inaccurate to identify the outgoing or exercise of thought with the phrase “kinetic energy,” for, though in thinking there is the transformation of power into act or work, the work is a form, not of motion, but of change or modification, which perfects the being of the mind or thinking power. The act of thought cannot be properly classed under any form of spatial motion,—whether from point to point simply, or as radiating from a centre to surrounding points, whether rectilinear, oscillatory, or vibratory. Displacement of motion of the particles of the brain may accompany the act of thinking; they are accompaniments merely, such as might fall under the cog-



nizance of sight or touch. The act of thought belongs to a totally different sphere. Further, there is no change of the nature of the mind in the exercise of thought—in the realisation of the power—nothing equivalent to transmutation, as in physical causality. Aristotle saw this long ago. He allowed *ἀλλοίωσις*, transmutation, in physical sequences; he properly denied that it extended to mind.\*

\* The conceptions indicated by *δυναμῖς* and *ἐνέργεια* ground the whole philosophy of Aristotle. He shows himself well aware of the difficulties connected with the very notion of primary organic development, and ascribes the impulse to a kind of indwelling soul or mind; *ψυχὴ ἔστιν ἐντελέχεια ἡ πρώτη σώματος φυσικοῦ δυνάμει ζῶν ἔχοντος.* (*De Anima*, II., i.) “The vital principle is the first form of a natural body having life in potency”—that is, capable of realising life. His whole views on this point are immensely in advance of certain current physical conceptions. Trendelenburg, in his learned note on this chapter, fully explains *δύναμις*, *ἐντελέχεια*, and *ἐνέργεια*. *Δύναμις* is “*rei facultas, quatenus ipsis rei conditionibus continetur; ἐντελέχεια* has *conditiones, hanc rei facultatem ad ipsius rei veritatem extollit, ut e δυνάμει nascatur et δύναμιν quasi consummet et absolvat.* Again, *ἐντελέχεια* and *ἐνέργεια* are thus distinguished:—“*ἐνέργεια*, magis ipsum rei actum, *ἐντελέχεια* statum ex actu exortum significat: *ἐνέργεια* in ipsa adhuc actione versatur, *ἐντελέχεια* contra ex actione in statu quodam acquievit, ut *ἐντελέχεια* aliquanto ulterius processerit quam *ἐνέργεια.*” The transition from the *δύναμις* to the *ἐνέργεια* is a species of motion, *κίνησις*; and *κίνησις* with Aristotle is so wide as to embrace the transition from one notion to another—that is, a kind of thought. The first entelechy of the universe would thus necessarily be thought or mind in some form.

But, apart from propriety of terminology, the distinction of potential and kinetic energy has a definite bearing on the present discussion. Potential energy is, in plain words, power in store for use or work,—as the unlit gunpowder in the loaded cannon, as the power in the bent bow, or in the wound-up watch. The atoms or ultimate elements of matter, if they are to be of any use at all in approaching combination, must at least be supposed to be endowed with potential energy of some sort. Whether originally this was simply the energy of gravitation-attraction, or whether they possessed chemical affinity and other higher kinds of attraction is not made clear. If they had only gravitation-attraction, we have the difficulty of discovering how on this basis the other and higher attractive powers arose. But, be this as it may, the serious difficulties lie beyond these points. Do these elementary particles, supposed to be endowed with potential energy of some sort, pass into motion *sud sponte*? Then there is no reason why, from the first moment of their existence, or during all eternity, if they be eternal, they should not have been in motion. If the spring of motion be in the atom *per se*, it need not wait for a time and outward

circumstances to develop itself. But, in this case, the energy could never have been potential at all—it would always be motion, visible or molecular. The whole notion of potential energy is swept away, and in its place we have a perpetual kinetic energy,—in other words, we have the gratuitous supposition of eternal movement.

But, to take the other alternative, Does the outgoing of the potential energy depend, as the very conception of it requires, on conditions external to itself? Is it a mutual attraction of particles endowed with potential energy? Then, what are the outward circumstances which have brought them into such proximity that the mutual attraction takes place? Where is the hand that set them in the sphere in which their possible energies came into play, or are made really available for work? The mere conception of the potential energy does not at all involve this actuality or realisation. There is wood and wood in the forest, and here the potential energy is such that rub them together and you will get heat and flame; but the great want is the hand to produce the friction. Transformation of potential energy into actual is no doubt the law of this uni-

verse ; but the conditions of the transformation—to say nothing meanwhile of the mode or direction—form the difficulty for atomic development. Either these conditions are to be found in contingent circumstances, which leaves the whole work to irrational chance, or they are to be sought in some form of intelligent power, which supersedes the exclusiveness of the atomic theory.

This bears very directly on the strictly ontological question as to whether there is anything in the supposed action of the crystalline and chemical laws, which seems to point to a contemporaneous or co-existing invisible power. In other words, are the atoms, with their supposed or real powers of mutual attraction and combination, sufficient of themselves to account for the synthesis of bodies, which we find has actually taken place in experience ?

We know that cohesive and chemical combinations depend for their possibility on the relative nearness of the elements. Atoms are supposed to be endowed with polar forces—one pole attractive, the other repulsive. But neither attraction nor repulsion acts beyond a certain point in space on other elements. The forces of Cohesion and Chemical Affinity, which

regulate the coming together of the particles that make up individual bodies, are pre-eminently forces that work only when the particles are near. Neither the cohesion of similar molecules in one body, nor the fusing power of chemical affinity which joins atoms of different kinds in a new form, as carbon and oxygen in carbonic acid, is possible unless the particles have acquired a position of proximity.\* In order, therefore, to any synthesis of elements, these must co-exist within certain mutual limits of space. Is this possibility of co-existence to be taken as the new sphere of contingency in the atomic theory? Or is it to be regarded as a collocation imposed upon the atomic elements *ab extra*?

But, further, supposing force to produce or pass into motion and synthesis of elements, as in crystalline structure, and supposing chemical forces to effect combination of atoms so as to form wholly new compounds, unlike either of the original elements, we have another important step before us ere we can get any complex structure, say plant or tree. For every

\* On this point see Mr. Balfour Stewart's treatise on *The Conservation of Energy*, Art. 68-71. It would be difficult to find a better specimen of lucid and well-developed exposition of physical conceptions than this volume.

definite form constructed depends only ultimately on the mere force or motion of its elements. It depends proximately and characteristically on the mode, direction, or determination of the molecular motions.\* The absolute variety, as well as definiteness of organic form, depends on the direction of the motion, and on direction limited and completed in a unity. Ere the plant arises in the symmetry of its perfect beauty, each molecule must take a definite direction and path, it must fall into fitness with its neighbour, and all must submit to a final limitation; otherwise there would be no definitude of leaf or flower, no individuality of plant or tree. But this is not at all implied in the fact that there are molecules mutually attractive, or primary forces capable of passing into motion in any direction whatever, or as another force lies. This is force working in subordination to an end, the possibly varying in space working steadily to a purpose, and if it be incapable of the purpose in itself, there is some power of idea animated by Intelligence, dominating in and regulating the process. The truth is that people have

\* See an able discussion on *What Determines Molecular Motion?* by Mr. James Croll.

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supposed that they were constructing an atomic theory of the world, when they were really dealing only with atoms in the abstract, fixing their weight, quantity, shape, as things to be considered in certain mutual relations, without raising any question as to how they got combined. The chemist may do this in his laboratory, with great advantage. He may even go on artificially constructing inorganic bodies. But the difficulties of the atomic theory of the world are subsequent to all this ; they lie not in the question of the properties of atoms, but in their modes of motion, direction of motion, and mutually adjusted movements in a definite place and time.

The difficulties of the atomic theory in this direction are greatly increased, as we contemplate the very varied forms of structure, or organism, whether animated by life or sensation. It is stated with confidence by Mr. Huxley that the lifeless elements of the protoplasm—carbon, hydrogen, nitrogen, oxygen—are the same for all organisms, for the fungus, the oak, the worm, and the man. He has admitted that life has not yet in our experience been produced from the synthesis of these elements, while he inclines to the view that somehow in the

indefinite past it did so arise. But even suppose this preliminary difficulty to be got over, there are greater beyond for the theory of linear development. If the basis of life be absolutely uniform, whence the immense variety of structural form—whence the absolute *differentiation*? Is this a thing we can conceive apart from idea embodied? And where is the impellent power, or *δύναμις*? To point out the mode of differentiation is no answer to this question, any more than to describe the orbital movements of the planets is identical with a theory of the cause of gravitation. And so long as we keep merely by the absolute uniformity of material basis, we are utterly helpless to make the variety of development intelligible.

The differentiation of form points undoubtedly to a concause, alongside, so to speak, of the mere inorganic protoplasmic material. It matters little how this concause is described ; it is at least proximately something in the shape of life superinduced upon the mere material basis. It is very difficult, if not impossible, to expound the relation of life to the inorganic elements, and its mode of action upon them. This power has been described by a writer of note as



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“that by which matter is set free from the dominion of its more primitive affinities, and lifted up above its former state of being,” and “as the play of affinities which cannot act but to resist and subdue the inorganic affinities ; which cannot erect their own peculiar superstructures, according to their own specific economy, without overcoming and demolishing at every step the affinities and structures of mere molecular-force work.” If this be so, we have an exemplification of the great primal law of the universe—the absorption and uplifting of a lower sphere of existence into a higher, through disintegration and death of its earlier being, in virtue of a power, a living power, which is unborn as it is undying, but not certainly in the purely sensuous mode of mere linear sequence.

Mr. Tyndall has told us, speaking of current views on this point, that certain authorities “admit their inability to point to any satisfactory experimental proof that life can be developed save from demonstrable antecedent life. As already indicated, they draw the line from the highest organisms through lower ones down to the lowest, and it is the prolongation of this line by the intellect beyond the range of

the senses that leads them to the conclusion which Bruno so boldly enunciated."\* Bruno, we are told in a note, was a "Pantheist," not an "Atheist" or a "Materialist." Bruno's conclusion is that matter is not "that mere empty capacity which philosophers have pictured her to be, but the universal mother who brings forth all things as the fruit of her own womb."

"Believing, as I do," Mr. Tyndall goes on, "in the Continuity of Nature, I cannot stop abruptly where our microscopes cease to be of use. Here the vision of the mind authoritatively supplements the vision of the eye. By an intellectual necessity I cross the boundary of the experimental evidence, and discern in that Matter which we, in our ignorance of its latent powers, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the promise and potency of all terrestrial life." † "The whole process of evolution," says Mr. Tyndall, interpreting Mr. Herbert Spencer, "is the manifestation of a power absolutely inscrutable to the intellect of man. . . . Considered fundamentally, it is by the operation of an insoluble mystery that life on earth is evolved, species differentiated, and mind unfolded

\* *Address*, p. 56. † *Ibid.*, p. 55.

from their pre-potent elements in the immeasurable past." \*

Now, I say the two positions involved in these statements are not consistent. They can be held only by one who has not sufficiently realised the meaning of each. If there be an "intellectual necessity" which leads us back beyond the lowest organism to its source, to the rise of its life, the whole process should be perfectly clear. If the intellect can prolong continuity backwards into this region, the mystery of life is solved. It is because it cannot, that a mystery there is. It is quite impossible to hold intelligently along with this that the whole process of evolution is the manifestation of a power absolutely inscrutable to the intellect of man, or that, "considered fundamentally, it is by the operation of an insoluble mystery that life on earth is evolved." Mr. Tyndall must make up his mind either to adopt the one position or the other. Both he cannot hold by. An intellectual necessity, however originated, is the clearest of truths.

But what is the nature, may I ask, of "the prolongation of this line by the intellect beyond the range of the senses," that leads to the conclusion of the

\* *Address*, p. 57-58.



potency of that thing called matter to evolve from itself life and mind? It is called apparently in one place "the Continuity of Nature." But it is not merely an experienced continuity; it is a continuity, if one at all, that stretches above and beyond experience. It transcends the vision of the eye and the inspection of the microscope. It is by "an intellectual necessity" that the boundary of the experimental evidence is crossed, and we reach in matter the promise and the potency of all terrestrial life. Now, there is a lack of analysis here, and of clear and definite thinking. The continuity of nature, as given in our experience, is one thing, an intellectual necessity is another. At least, it is not necessarily identical with a generalisation from experience. We have intellectual necessities that ground the very possibility of our experience itself. Is the so-called necessity in the case before us of this sort, or is it simply a derivation from experience? We should have some definite statement as to the character and origin of this necessity, and then we shall be able to know something of the extent of its application. Experience of the continuity of nature may, of course, be supposed, as by some thinkers, to generate

an intellectual necessity ; but, at the utmost, this necessity of knowledge or belief would not legitimately extend to a point before the commencement of the system whose continuity only we know. If the course of things now and here, as far as we observe and legitimately infer regarding the unobserved, be continuous, and if we are even necessitated by experience to think it so, it does not follow that there never was an origin or rise of the elements of the system, except out of other material or similar elements. This is simply an off-hand transfer of phænomenal conceptions to noumenal reality, without any consciousness of the difficulties of the question.

But even supposing that this continuity were proved independently and legitimately, all that follows really is that our system is linked on to preceding and probably wholly indefinite lines of past systems. And this only shifts the real difficulty of the case further back. It in no way removes it for reflection. For it remains to be asked—Whence the order, the laws, and the life of those systems, or even of those elements, out of which ours has arisen, and whence it has derived these characteristics ? It is the nature of



the material of the system, so to speak, which causes the difficulty. We cannot get life or mind out of it now,—out of anything but life or mind pre-existent. Of what use, then, is it to prolong the existence of matter or energy backwards through millions of years, expecting in that way that an intellectual difficulty arising from the very quality or character of the thing, so to speak, should be thus solved by time? Why, instead of helping us, all that we can thus get is an increased amount of perplexity.

It is but fair to Mr. Tyndall to say that he seems by various expressions, to point to a conception of matter different from the ordinary one which is described loosely as that of a mere capacity. He possibly refers to the newly analysed element of force or energy, which in some of its forms is superior to gravitation, is weightless; as in heat, absorbed or radiant. But so long as the element of life is not interposed, neither mass nor energy, nor both combined, will help us in the evolution of life and sensation. What we have not found in experience is life being evolved out of any form of either matter or energy. We have no right, therefore, to suppose that in some time beyond experience it was so evolved. And if the element of

life be superadded to original mass and energy, either as actual or potential, the whole point at issue is begged.

Mr. Tyndall has said very strongly that the whole process of evolution, which may be taken generally as meaning the development of the matter of our experience, is "the manifestation of a power absolutely inscrutable to the intellect of man. . . . Considered fundamentally it is the operation of an insoluble mystery that life on earth is evolved."\* Now I venture to think that this is not only a strong but a rash statement. It supposes a power that operates in evolution, and it declares it to be absolutely inscrutable. In a sense and to a certain extent, no doubt this may be true. The how or mode of this power is inscrutable. We cannot in thought or imagination place ourselves at the point of this power, this potentiality, and therefrom conceive the evolution of things. But what is inscrutable as to mode or how of action is not necessarily absolutely inscrutable, nor does it involve "an insoluble mystery." We know this at least, that the line of operation of the power, supposing it to be and to act,

\* *Address*, p. 57.

is in accordance with idea, that is, definite end. We cannot possibly express its action in any other way. It is idea varied to the utmost complexity of conception. It is more, it is idea embodied as we conceive idea. Space, Time, Cause, Identity, Perdurance, and other notions, are the only forms in which the real appears to us, and in which we can conceive it. Is, then, the operation of this power so absolutely inscrutable as it is represented to be? How it makes or moulds matter or atoms to its ends or ideas, we do not know, and perhaps cannot even conceive. But is there not some degree of intelligibility on the point in question? Is it not something to know that we can describe the results of the working of this power only as we can describe the results of the working of intelligence in our experience? That thus the highest, indeed the only way, we can conceive of this power, inscrutable in many ways, is as if it were embodying ideas, and the ideas essential to our own modes of conceiving things? Does it not hence appear as if there were some sort of community between the power at work in the great phænomenal world around us, and the laws and processes of that intelligence of ours, through which the



very conception of the phænomenal and all that it involves is possible for us? If we find an analogue of human intelligence in the universe, surely we cannot pronounce the principle of things an insoluble mystery, or a pure unknowable. Comparatively, it is hardly a greater mystery than the working of our own thought, yet we do not regard this as thus either wholly incognisable, or as unreal.

It seems to me to be an exceedingly narrow way of putting this whole question, to say, as is currently done, that you must have either a development throughout of the organic (vegetable and animal) from the inorganic, according to the laws of crystalline structure and chemical combination, or distinct successive acts of creative power,—interpositions, as it were, at successive stages, of this otherwise progressive development. These are not the true alternatives, and the setting them up implies an illegitimate dualism. We have no right to put the unseen or divine power, supposing it to exist, in a sort of spatial extremity to the developing world, and to imagine that this power must act only by interference, interposition, and addition, at particular points. This is a grossly sensuous image of Deity. It is such

a dualistic conception as to set Deity in a limited sphere by himself,—in fact, to abolish his true reality. In development, in crystalline structure, in chemical combination, there is a strictly reasonable, though invisible element, in virtue of which it is what it is. These sensuous manifestations seem to partake of, and to show forth a Reason at the root of things. But this Reason is not to be conceived of as that which existed once at the beginning,—set things agoing, and then withdrew, again occasionally to interpose. It is a consecutive and contemporaneous Reason, a power co-existent with everything that exists and assumes orderly form. If we admit it all, it is necessarily always and everywhere. This conception entirely supersedes the need for imagining what are called “distinct creative acts,” as if creation stopped and began again, or as if the creative were not the efficient and sustaining power all through time. And it is in no way incompatible with a theory of development, provided we keep in mind the true limits of such a theory viewed as a conception of the progress of inorganic elements. These would give, in successive periods, increasingly complex forms of structure, inorganic and organic, vegetable and animal.

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We might go on from the lowest organisms upwards to man, considered as increasingly complex structural forms. This would be one side of the universe—the sensuous, pictorial, or visible side. Here antecedent and consequent might be rigidly conjoined through the longest periods of time,—uniformly, regularly, so as to give the utmost scope for scientific inquiry, and the firmest ground for scientific law. Yet it might be necessary all the while to consider as co-existing with this evolution, as co-operating with it, an invisible power of Reason, even of Will, which, however, never deviated from the original plan, never broke in upon it by distinct acts of interposition and creation, but silently showed itself all through in a harmonious and contemporaneous development of definite idea in crystalline structure and in chemical combination, of life in the germ, of sensation in the animal, of self-consciousness and personality in man.

This divorce of Deity from the Universe holds true even of the view adopted by the authors of *The Unseen Universe*. Deity, or the Unconditioned, as he is termed in the work, is put back so far in time as to be pushed out of it altogether. He does not act in time but in eternity, whatever that may mean. The

real agents are the Spirit and the Son—the former the author of life, the latter of energy. It is quite unscientific and unwarrantable to rise at any point, even of apparent origin, to the Unconditioned himself. We must rest at the best in the delegation of his power to a conditioned invisible intelligence. And the action of the latter takes place only when the energy of the visible universe cannot afford an explanation of a definite effect—as, for example, the first appearance of life, which cannot, in their view, be regarded as a form of energy transmuted in the ordinary line. If Deity ever had anything to do with the setting agoing of the machine of the visible universe, he has now at least left it solely to the transformation of condition into conditioned, and to the energies and intelligences of the invisible sphere, occasionally to help it to higher development, or over a hitch in its way. He is a mere abstraction, or an otiose Deity, who has retired from the scene, leaving the work to subordinates. This is the patch-work of uncalled for hypothesis. The simple, the natural explanation of the difficulties of the insoluble breaks of continuity—the rise of the atom, the first appearance of life, of sensation, of mind, is the doctrine of the

manifestation of Divine Energy — an energy which is in and through the whole ordinary, or continuous energies. These are daily working to ends and according to idea; and mere mass or energy, thus made effectual, does not ground, but presupposes, regulative thought.

The main source of the difficulties on the subject of Supersensible or Divine Power lies in the narrow view of causality, already noticed, which has been long prevalent both in philosophy and in science. In accordance with this conception of causality, as essentially sequence in time, men have been led to suppose that the world must be developed all through in a straight line from antecedent to consequent, or from condition to conditioned. When this meagre conception was found inadequate to explain the whole development,—when, for example, it was found impossible to show the form of matter or energy which could be transformed into the rise of life, or the material condition of sensation and personality,—recourse was had to the theory of special acts of supernatural intelligence. Physical forces and laws were supposed to go on for some time without interference, and then, at different epochs, there was the

direct interposition of this intelligence to put life into the inorganic, and self-consciousness into man, or even to add new species to those already in being.

But the difficulties of this theory of specialty of action are insuperable. How can the Highest Being be worthily supposed to cut off a part of His being, say physical elements and law, and let this go on, without and apart from Him for some time, and then come in with a new supernatural act across, as it were, the line of time, making an addition to the sum of things? If we are to connect the notion of time with Divine action, is it not more reasonable to suppose that this invisible power is ever co-existing and co-operative in the course of development,—ever living and ever radiant of the life which He possesses, as outcome of His being, as His end and joy? If this be so, invisible causality was in things from the first, is all through them; the causal connection of natural phænomena is not a thing independent of this invisible power; physical antecedents are simply the conditions under which each successive development of this unseen causality, which has equally influenced all sequences from the first, is made manifest in the

order of evolution. According to this conception, we may quite well allow atomic combination, mechanical and chemical in obedience to idea ; we may allow the apparent or phænomenal passage, when proved, which has not yet been done, of the inorganic basis of life into the living germ ; the rise of sensation in the animal organism, and of personality in man ; and all these as keeping pace with increased structural development. But we should err in isolating those successive stages of progress from the free power of their real causality,—contemporaneous Life, Reason, and Will fused in a Unity. It would be easy to name this doctrine Pantheism. It is really not so. It is at once Pantheistic and Theistic. It is pantheistic, inasmuch as it separates no power from Deity ; it is theistic, inasmuch as it represents the world-evolving power as regulated by idea, and, therefore, grounded in Personality.

I cannot now enter into the question as to whether or in what form the sensible world, or world of our experience, subsists apart from our perception of it, or apart from any percipient. But it is necessary to say that the question as to the supersensible reality of the outward world is not to be decided forthwith by

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any view which we may take of its proper nature and reality while it is an object of perception or experience. This world may appear to us as a resisting force, extended or space-filling, or it may be regarded as that which, in the form either of mass or energy, we are unable to add to or take from in any degree. These would be to us the tests of a sensible world really existing, and different from us the knowers, but still only of a world manifested and existing in relation to our power of conscious effort, or to the conscious limitation of our creative and annihilative power. It is obvious that we cannot transfer this wholly relative conception of sensible reality to an absolute sphere, or one in which we cease to be and to know. Much less can we set up the objective term of the relationship and regard that as the only and the generative one. Yet this is precisely what the atomic theory does,—it is, in fact, what every theory of the sort must do, which professes to evolve sensation and thought out of organism, and ultimately out of atomic combination. The truth is we can never absolutely isolate any object, be it atom or molecule, in a proof or demonstration from definite thought, from a self-conscious subject or self which



deals with it, deals with it even as a basis of proof. Of absolute object we know nothing; as we know nothing of absolute subject, in the sense here required. These may be possible, but they are not intelligible, and therefore are useless in demonstration. No demonstration can start from a point above human knowledge. And if the very intelligible contemplation of the atom or molecular mass supposes a conscious personality, we can never show even the possibility of the derivation of personality from the mere abstract atom. The personality so derived would be not from the atom or molecule by itself, but from it in its co-existence with the personality which is the condition of its known existence. How can I, the thinker, be proved to be evolved out of an object, out of atoms, when the very definite or known existence of these things supposes a thinker, supposes a me already there along with the atoms to preside over the demonstration of the evolution of *self*?

The atomic position as put in ancient and in modern times seems to me to be simply the result of a vulgar or irreflective realism. Atoms are supposed with certain definite properties; they are supposed to exist and to act; they are described in the language of the

known and conceived ; yet they are supposed to be before thought or mind is, to be in fact the generators of it. Things *minus* thought are, and they generate life, sensation, and thought. Now I can understand the philosophical doctrine which relegates all above or beyond a conscious subject, to the sphere either of the meaningless or the unknowable. But I cannot understand the consistency of a doctrine which first of all throws out an intelligent and still holds by an intelligible, which dispenses with a known and yet holds by a known. If there be no conceiving mind, neither atom nor anything with a definite known property can be set up as an absolute or first beginning ; if there be a conceiving mind, atom is not the first or absolute beginning of things and thought.

I confess, indeed, that I am a good deal surprised that any one, who is at all acquainted with the requirements of a reflective solution of the problem of the ultimate reality of things, should take his stand on the ultimate basis of insentient atoms or forces. Men of abstract thought in these times are not unfrequently charged with ignorance of physical facts and science, and of setting up theories in this spirit. I am not prepared to say that the charge is

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altogether unfounded. But may not the abstract man turn round and say to the physicist, How is it that you set up your atomic and other theories without knowing apparently or considering in the least what has virtually been said against all such arbitrary hypotheses by speculative thinkers? I find in none of the scientific authorities who are now dealing with this question any indication that they are aware of what has been said on this very point during the last two hundred and fifty years, especially since the time of Hume. The attempt of Hume to construct a system of the universe was really founded on the atomic principle. Hume sought to carry out in reflective philosophy the precepts of Bacon and the practice of Newton. His question was—How can I show the genesis of human knowledge, of this world of consciousness, as we find it? Gravity, the mutual attraction of particles, seems to explain the combinations of the sensible world. May there not be something analogous to this in what is called the intellectual or conscious world? Can I get back to a singular which repeated, copied, or aggregated shall explain this consciousness of ours? Hume thought this possible. The ultimate element in human know-

ledge was, according to his view, be it dogmatical or hypothetical, "the singular impression of sensation;" and the principle which aggregated these impressions was the law of association, as with Newton the law of gravity bound together material elements and bodies. Hume sought thus to explain the intelligible world of our experience. And this seems to me to indicate a just view of the nature of the problem. To go back to a point millions of years ago, and to set up certain things called atoms, absolutely divorced from intelligence, and to say that in the course of an indefinite time these worked up to our consciousness, appears to me to be putting the possibility of solving the question at a most unnecessary disadvantage. It would be more natural and reasonable to ask, first of all, as with Hume, can we solve the problem of the intelligible world, by starting with singulars endowed with sentiency or sensation? These are really atoms: they are really the last things we can possibly begin with to solve any question of this sort. We cannot get beyond sentient or sensational indivisibles, because we should then part company with definite consciousness of aught whatever. And if we cannot solve the questions of the origin of thought and con-

sciousness with these sensational atoms, so to speak, much less can we solve it by a hypothesis of insentient atoms, or atoms transcending consciousness. But no one now-a-days surely will say that Hume's solution of the question, regarded dogmatically, is a satisfactory one. Sensation cannot be abstracted from thought, and set up as its origin or genesis. Sensation cannot by any amount of abstraction which remains intelligible be separated from category or notion. Sensation must be one, one out of many, here and now,—must in fact be taken up along with thought which takes it in, and something more; which, in a word, is general or universal. And sensation cannot possibly generate thought, for the simple reason that a copy of it would be as much a singular as the original sensation itself. And it could very easily be shown that the theory of the aggregation of sensations through association supposes a continuous unity and identity of mind or consciousness, for which we have no original or equivalent in any sensation. It could be shown even that this very series or diversity of sensations implies as its correlate this grounding identity. In a word, Kant's position that category or thought is needed for the intelligibility and the existence of sensation, is irre-



fragable. But if Hume fails to generate the intelligible world of our consciousness—our thought, personality, identity, or true conscious being—from even sensational atoms or singulars, what are we to say of an attempt to generate all this sphere of reality from things called atoms, that have not yet worked up even to the position of isolated sensations? All we can say is that the men who have started from such a beginning have not apprehended the true requirements of the question, and that their hypothesis of atoms, above sensation and consciousness, cannot be the basis of any demonstration or rational theory of the universe.

The question which I have but very imperfectly touched at this time is one of a class of questions in which the existence of a society such as this shows there is still here an unflagging interest. It is certainly most fitting and most gratifying to find an interest of this sort vital and powerful in the city where Hume speculated, and but recently Hamilton taught. As the years flow on, one is increasingly impressed with the rareness of a life such as that of Hamilton—a life that rose grandly yet naturally above the seductions of the merely professional, to daily communion with

questions of ultimate principle and the reality of things. We may well prize the almost singular example, and cherish its priceless moral power. Apart from the immense amount of faculty absorbed in purely professional pursuits, men, who rise to an interest in truths or facts in special departments of knowledge, think they have reached a very great height. But the lesson of speculative inquiry is that truth is higher than truths, that a comprehensive sense of the nature and conditions of truth is the most elevating thing of which a man can become conscious, and at the same time the greatest means of teaching true catholicity and toleration. I know nothing less worthy of a reflective man than a state of mind made up in regard to all the great questions of the nature and ultimate issues of things in our experience, made up too probably in the absence altogether of any distinct personal grappling with those questions. This is the traditional spirit, and it is throughout unworthy, and generally intolerant of difficulties it has never itself known. Its only recommendation, and in these times it is a rare one, is that it sometimes implies an excess of reverence.

We may have, and no doubt we have, difficulties

in determining the ultimate truth and reality of things. What is this but to say that we seek that which we know to be, and, as we fail to find it in experience, that the notion or ideal of the thing is higher than any experience which we reach? Surely if we fail to reach truth in our experience, and we yet seek it, we must be led to the search by some latent ideal, which experience never gave us? It is our nature going out of itself, and finding that it contains higher things than it can discover in that outward on which it ventures. A faith in this, even when we do not find truths, is ennobling; it is a faith in the ultimate or supersensible reason of the universe, which is a far higher state of mind than the most confident belief in a compassing on our part of truths. However great may be our doubt or disbelief regarding the actual truths presented to us, or reached by us, there is always hope for us if we hold by a faith in an ideal or possible truth. We shall thus have still a trust in our nature and in what is possible in reason, and this will animate us with hope, and hope will inspire exertion, and keep our hearts and minds open to impressions from the fulness of the Living Power that is above and around us, and in our own souls.



A belief in a true, a good, and a beautiful above forms of error, sin, and deformity, is fitted to freshen and broaden our nature, even when we suppose that we have actually reached truth, right, and beauty. For, however wide may appear to be our view or belief of actual truth, beauty, or goodness, we may be assured of this, that it is never equal to the ideal, to the possible for us to attain. The true is always wider than actual truth; the good always purer than actual goodness; the beautiful always higher than nature or art can give us; and the thought that our best result is after all but a faint shadow of a higher ideal will lead us to hold the actual with tolerance, with humility, with reverence, as that which a purer light may some day show to be a very imperfect realisation of a fuller type. In doubt about actual truth and goodness, faith in our ideal will save us from despair and degradation; in confidence regarding the truth which we think we have found, the same faith will keep us from exaggeration, self-confidence, intolerance, and an inhuman spirit.





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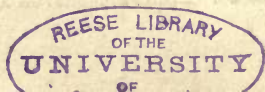
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